



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REMARKS

Objections to Drawings.

The Specification has been amended to address the objection to the drawings. The reference sign 312 has been added. The amendment presents no new matter as the reference sign was already in the drawing and clearly refers to the corresponding step in the Specification.

Rejection of Claims 1, 2, 10, 13 and 14 Under 35 U.S.C. §102(e) based on *Van Autryve et al.* (U.S. Patent No. 6,014,979).

The rejection of claims 1 and 2 will first be addressed.

The invention of claim 1 is directed to a method that cleans a plasma reactor chamber part. The chamber part can have a material redistributed thereon by a reactive plasma process. The chamber part is placed in a redistributed material solvent.

As is well known, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference. Because the reference *Van Autryve et al.* does not show all elements of claim 1, this ground of rejection is traversed.

Van Autryve et al. does not show a chamber part that is placed in a redistributed material solvent. *Van Autryve et al.* is directed toward a cleaning plasma for semiconductor processing. In *Van Autryve et al.*, following a processing time of 100-300 hours a plasma chamber receives a "wet-clean." The wet-clean of *Van Autryve et al.* includes a solvent. However, in the method of the cited reference, solvent is applied to a surface of a chamber, but a chamber part is never placed in a solvent, as recited in claim 1.¹

Thus, because the cited reference *Van Autryve et al.* does not show every element of claim 1, this ground for rejection is traversed.

The rejection of claims 10, 13 and 14 will now be addressed.

Claim 10 is directed toward a method of plasma cleaning a reactor chamber part. A chamber part may have a material redistributed on a chamber part by a reactive plasma process.

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A chamber part may be cleaned with a plasma having an etch selectivity between the chamber part and the redistributed material that is greater than 1:100.

The reference *Van Autryve et al.*, relied upon in rejecting claim 10 has no explicit description nor suggestion of any etch selectivity, let alone the specific etch selectivity recited in claim 10. That rationale for rejecting claim 10 is set forth below.

[I]t is inherent that the etch selectivity between the chamber part and the redistributed material is greater than 1:100 because Van Autryve discloses the same invention.²

It is believed that this rationale is not sufficient to support a rejection. First, the rationale is hindsight. The statement “Van Autryve discloses the same invention” is conclusory and not supported by any argument or rationale. This fails to meet the necessary burden of proof required in an anticipation rejection. An examiner must provide rationale or evidence tending to show inherency.³ Because no rationale or evidence is provided in the rejection, the burden of proof has not been met and anticipation cannot be established.

For this reason, the rejection of claims 10, 13 and 14 on this ground is traversed.

Rejections of Claims 1, 3, 5, 7, 9-11 and 14-16 Under 35 U.S.C. §103(a), based on *Knapp et al.* (U.S. Patent No. 4,975,146).

The rejection of claims 1, 3, 5, 7 and 9 will first be addressed.

The invention of claim 1 is directed to a method that cleans a plasma reactor chamber part. The chamber part can have a material redistributed thereon by a reactive plasma process. The chamber part is placed in a redistributed material solvent.

To establish a prima facie case of obviousness, a rejection must meet three basic criteria. First, there must be some suggestion or motivation to modify a reference or combine reference

¹ See *Van Autryve et al.*, Col. 11, Lines 12-15, which describes a wet clean process as “scrubbing” internal surfaces of a plasma chamber with acetone. No parts are ever placed in acetone.

² See the Office Action, dated 12/06/2001, Page 2, last two lines.

³ See MPEP §2112.

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teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations.

Because the reference does not show or suggest all the limitation of claim 1, a *prima facie* case of obviousness has not been established.

The proposed modification of the reference *Knapp et al.*, relied upon in rejecting claim 1, does not show or suggest placing a chamber part in a redistributed material solvent, as required by claim 1. *Knapp et al.* is directed to a method of removing coatings such as titanium nitride, from surfaces such as tools and molds. It appears that the rejection equates a coating of *Knapp et al.* with a redistributed material as set forth in claim 1.⁴

In such an interpretation, *Knapp et al.* does not show a chamber part placed in a redistributed material solvent, as required by claim 1. *Knapp et al.* discloses cleaning a surface of a nitride film with acetone. However, acetone is not a solvent for the nitride films of the references and is not described as such. Acetone is only a cleaner for a nitride coating, not a solvent for a nitride coating.

Knapp et al. is further lacking in that the reference does not show a method for cleaning a part having redistributed material thereon. In *Knapp et al.*, a coating (argued to correspond to a redistributed material of claim 1) is not indicated as being redistributed. In fact, no mention is made in the reference on how such coatings are formed. Because the reference *Knapp et al.* is silent as to how a coating is formed, such a reference cannot be construed as teaching a redistributed material as set forth in claim 1.

Other necessary criteria for establishing a case of obviousness are also lacking.

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found in either the references themselves or in the knowledge generally available to one of ordinary skill in the art.

It is not believed that sufficient motivation has been demonstrated. The rationale relied upon for modifying *Knapp et al.* is set forth below.

⁴ See the Office Action, dated 12/06/01, Page 3, Lines 11-13, addressing the rejection of claim 10.

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It would have been obvious to one of ordinary skill in the art at [the] time the invention was made to clean a reactor chamber part with the method of Knapp because Knapp teaches a general method for removing unwanted material from surfaces exposed to the interior of a plasma etching chamber.

Such a rationale is believed to be insufficient. *Knapp et al.* provides various examples of surfaces, unrelated to plasma chamber parts, that are stripped of a coating within a plasma chamber. There is no mention in the entire patent of actual plasma chamber parts. *Knapp et al.* describes protective coating on surfaces of plates and tools (such as tools for punching, cutting and drilling metal, or the like), but such surfaces are cleaned in a plasma etcher, and not part of a plasma etcher whatsoever.⁵

Accordingly, because the reference never mentions plasma chamber parts, it is not understood how such a reference can suggest a cleaning of plasma chamber parts absent the benefit of hindsight. As is well established, hindsight is impermissible in establishing the motivation required for a case of obviousness.

Thus, because motivation for the modification relied upon is lacking, a prima facie case of obviousness has not been established for claim 1.

For these reasons, the rejection of claims 1, 3, 5, 7 and 9 on this ground is traversed.

The rejection of claims 10, 11 and 14 will now be addressed.

Claim 10 is directed toward a method of plasma cleaning a reactor chamber part. A chamber part may have a material redistributed on a chamber part by a reactive plasma process. A chamber part may be cleaned with a plasma having an etch selectivity between the chamber part and the redistributed material that is greater than 1:100.

To the extent that claim 10 recites a redistributed material, the comments set forth above for claim 1 are incorporated by reference herein. Namely, that a coating of *Knapp et al.* is not shown or suggested to be a redistributed material as set forth in claim 10.

Thus, the modification relied upon in the rejection does not show all elements of the rejected. Accordingly, a prima facie case of obviousness has not been established for claim 10.

⁵ See *Knapp et al.*, Col. 1, Line 67 to Col. 2, Line 2.

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Dependent claim 14 includes additional limitations not shown or suggested by the modified reference. Claim 14 adds includes a cleaning with a solvent of the redistributed material. To the extent that claim 14 recites a redistributed material solvent, the comments set forth above for claim 1 are incorporated by reference herein. Namely, that the cleaning solution of *Knapp et al.* is not shown or suggested to be a solvent of any of the coatings removed by the process of *Knapp et al.*

For these reasons, the rejection of claims 10, 11 and 14 on this ground is traversed.

The rejection of claims 15 and 16 will now be addressed.

Claim 15 is directed toward a method of cleaning reactive plasma chamber parts. The method includes applying an organic solvent to a surface of a chamber part. The method also includes oxygen plasma cleaning the chamber part.

To the extent that claim 15 recites a chamber part, the comments set forth above for claim 1 are incorporated by reference herein. Namely, that no motivation exists to modify *Knapp et al.* to clean chamber parts, as the reference never mentions chamber parts.

Rejections of Claims 1, 2, 5, 7, 8, 15 and 16 Under 35 U.S.C. §103(a), based on *Roman* (U.S. Patent No. 4,334,950).

The rejection of claims 1, 2, 5, 7 and 8 will first be addressed.

The invention of claim 1 is directed to a method that cleans a plasma reactor chamber part. The chamber part can have a material redistributed thereon by a reactive plasma process. The chamber part is placed in a redistributed material solvent.

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found in either the references themselves or in the knowledge generally available to one of ordinary skill in the art.

Like the rejection based on *Knapp et al.*, it is not believed that sufficient motivation has been demonstrated in this rejection. The rationale relied upon to modify *Roman* is set forth below.

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It would have been obvious to one of ordinary skill in the art at [the] time the invention was made to clean a reactor chamber part with the method of Roman because Roman teaches a general method for removing unwanted material from surfaces exposed to the interior of a plasma etching chamber.

Like the rejection based on *Knapp et al.*, such a rationale is believed to be insufficient. *Roman* provides various examples of etching devices relying on magnetic properties, again unrelated to plasma chamber parts that are etched within a plasma chamber. There is no mention in the entire patent of actual plasma chamber parts. The various examples of *Roman* are directed toward devices relying on magnetic properties, none of which are described as being associated in any way to plasma chamber parts.⁶

Accordingly, because *Roman* never mentions plasma chamber parts, it is not understood how such a reference can suggest a cleaning of plasma chamber parts absent the benefit of hindsight.

For these reasons, a prima facie case of obviousness has not been established for claim 1, and the rejection of claims 1, 3, 5, 7 and 9 is traversed.

The rejection of claims 15 and 16 will now be addressed.

The invention of claim 15 is directed toward a method of cleaning reactive plasma chamber parts. The method includes applying an organic solvent to a surface of a chamber part. The method also includes oxygen plasma cleaning the chamber part.

To the extent that claim 15 recites a reactive plasma chamber part, the comments set forth above for claim 1 are incorporated by reference herein. Namely, that the motivation relied upon in modifying *Roman* is not sufficient.

Rejections of Claims 1, 2, 5, 7, 8, 15 and 16 Under 35 U.S.C. §103(a), based on *Kiziloglu et al.* (U.S. Patent No. 6,074,569).

The rejection of claims 1, 2, 5, 7 and 8 will first be addressed.

⁶ See *Roman*, Col. 1, Lines 9-11, Lines 15-16. See Col. 2, Lines 45-47, which indicates that *Roman* is generally applicable to devices which require a planar geometry. However, again there is no mention or suggestion that such devices can be a part in a plasma reaction chamber.

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The invention of claim 1 is directed to a method that cleans a plasma reactor chamber part. The chamber part can have a material redistributed thereon by a reactive plasma process. The chamber part is placed in a redistributed material solvent.

This rejection appears no different than those relying on modifications of *Knapp et al.* and *Roman*. Like these latter rejections, the motivation relied upon in the present rejection is believed to be insufficient. As in the previous cases, the rejection admits that *Kiziloglu et al.* does not show a plasma reactor chamber part, as set forth in claim 1. The rejection then argues it would be obvious to modify the method because the method shows removing unwanted material from surfaces exposed to the interior of a plasma etcher.

Motivation in an obvious rejection must be found in some teaching, suggestion, or motivation in the references themselves or in the knowledge generally available to one of ordinary skill in the art. It is not believed the references provide motivation.

Kiziloglu et al. provides examples of photoresist stripping methods. Such photoresist is never described as being on a chamber part.⁷ Thus, all examples set forth in the reference are unrelated to plasma chamber parts.

Accordingly, because *Kiziloglu et al.* never mentions plasma chamber parts, it is not understood how such a reference can suggest a cleaning of plasma chamber parts absent the benefit of hindsight.

For these reasons, a prima facie case of obviousness has not been established for claim 1, and the rejection of claims 1, 2, 5, 7 and 8 is traversed.

The rejection of claims 15 and 16 will now be addressed.

The invention of claim 15 is directed toward a method of cleaning reactive plasma chamber parts. The method includes applying an organic solvent to a surface of a chamber part. The method also includes oxygen plasma cleaning the chamber part.

The reference *Kiziloglu et al.* is relied upon in rejecting claims 15 and 16. Such a reliance is believed to be misplaced as the reference teaches away from the present invention. The rejection cites various portions of *Kiziloglu et al.* to support the rejection, however such portions of the reference are directed toward a conventional method that fails to clean the

⁷ See *Kiziloglu et al.* Nowhere in the reference is it shown or suggested that a "substrate" with a photoresist mask is that of a chamber part.

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surface.⁸ Thus, the cited reference teaches away from Applicants' invention, and so does not suggest the invention.

Accordingly, a prima facie case of obviousness has not been established for these claims.

Rejections of Claims 1, 2, 5, 15 and 16 Under 35 U.S.C. §103(a), based on *Eidelloth et al.* (U.S. Patent No. 5,646,095).

The invention of claim 1 is directed to a method that cleans a plasma reactor chamber part. The chamber part can have a material redistributed thereon by a reactive plasma process. The chamber part is placed in a redistributed material solvent. The invention of claim 15 is directed toward a method of cleaning reactive plasma chamber parts.

This rejection is essentially the same as that of *Knapp et al.*, *Roman*, *Hira et al.*, and *Kiziloglu et al.* The reference relied upon in this rejection, *Eidelloth et al.*, is directed toward methods of etching superconductive films. Such films are never described as being on or related to a chamber part.⁹ Thus, all examples set forth in the references are unrelated to plasma chamber parts.

Accordingly, because *Eidelloth et al.* never mentions plasma chamber parts, it is not understood how such a reference can suggest the cleaning of plasma chamber parts absent the benefit of hindsight.

For these reasons, a prima facie case of obviousness has not been established for claim 1, and the rejection of claims 1, 2, 5, 15 and 16 is traversed.

Rejections of Claims 6, 12 and 20 Under 35 U.S.C. §103(a), based on *Knapp et al.*

The argument set forth above to address the rejection of claim 1 based on *Knapp et al.* is incorporated by reference herein. Namely, that the proposed modification to *Knapp et al.* does not show multiple limitations of claim 1, and motivation for the proposed modification is lacking.

Dependent claims 6 and 12 further add that a chamber part may further be cleaned with a

⁸ See the Office Action, dated 12/6/2001, Page 4, Lines 17-22, which refer to *Kiziloglu et al.*, Col. 6, Lines 42-47. But see *Kiziloglu et al.* Col. 6, Lines 46-47, which indicates that the process relied upon in the rejection "still failed to clean the surface substantially of all resist residue."

⁹ See *Eidelloth et al.* Nowhere in the reference is it shown or suggested that the superconductive films are that of a chamber part.

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plasma having a radio-frequency (RF) power in the general range of 500 to 1000 W.

It is not believed that a prima facie case of obviousness for Applicants' claimed range of 500 to 1000 W has been established.

The reference *Knapp et al.* discloses a power range of "about 400 W."¹⁰ A prima facie case of obviousness can exist where claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties.¹¹ In the present case, the prior art range is not believed to be close enough. The claimed range represents a 25% increase in power over the prior art range – and hence the ranges are not close enough to be expected to have the same properties.

The rejection argues that a "slight" increase in RF power would increase the rate of cleaning, decrease the length of the process, and improve cleaning effectiveness.¹² First, a 25% increase in a variable is not believed to be slight. Second, the reference relied upon implies that changing such variables can have undesirable consequences.¹³ Accordingly, any suggestion to increase a power level a full 25% is believed to be lacking in the references.

Thus, the cited range of claims 6 and 12 are not believed to be obvious in light of the reference.

Claim 20 adds the additional limitation of further baking a chamber part at a temperature greater than 80°C for at least 15 minutes.

A prima facie case of obviousness has not been established for this claim as the proposed modification does not show a baking step as recited in claim 20. *Knapp et al.* discloses plasma etching at 80°C. Of course this is not baking, but etching.¹⁴ In fact, *Knapp et al.* does not appear to describe any baking step at all.

Thus, the modification to *Knapp et al.* relied upon in rejecting claim 20 does not show all limitation of claim 20. Accordingly, a prima facie case of obviousness has not be established for

¹⁰ See *Knapp et al.*, Col. 2, Lines 46-47.

¹¹ See MPEP §2144.05, citing Titanium Metals Corporation of America v. Banner, 227 USPQ 773 (Fed. Cir. 1985).

¹² See the Office Action, dated 12/6/01, Page 6, Lines 15-17.

¹³ See *Knapp et al.*, Col. 2, Lines 51-54. Which states that the plasma will not damage the underlying surface if it is removed within reasonable amount of time following the complete removal of the titanium nitride coating. Thus, increasing the rate of cleaning as suggested in the rejection may expose an underlying surface to potential damage faster.

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this claim.

For all of these reasons the rejection of claims 6, 12 and 20 is traversed.

Rejections of Claims 17-19 Under 35 U.S.C. §103(a), based on *Roman*.

The argument set forth above to address the rejection of claim 15 based on *Roman* is incorporated by reference herein. Namely, that motivation for the proposed modification is lacking.

Claim 17, which depends from claim 15 adds the limitation of rinsing the chamber part with de-ionized water after applying

With respect to claim 17, the motivation relied upon in modifying the prior art reference does not exist. The rejection appears to be based on incorrect facts. Applicants' background art is not suggestive of claim 17, as it does not show a rinsing of a chamber part with de-ionized water after applying an organic solvent. Applicants' background art does discuss cleaning chamber parts with hydrogen peroxide and ammonium hydroxide.¹⁵ These are not organic solvents.¹⁶

Accordingly, the rejection of claim 17 relies on a teaching not shown in the background art, and so cannot be sustained.

Additional Arguments

Applicants' note all five rejections based on 35 U.S.C. §103(a) are single reference rejections. Importantly, each and every one of these rejections admits that the element of "a plasma reactor chamber part" is missing. Yet, despite this fact, the rejection asserts that the inclusion of this element is obvious.

Applicants' believe that this is further evidence teaching away from the invention. That is, the alleged obviousness of the reactor chamber part limitation of Applicants' claims cannot be supported by multiple cumulative rejections that all admit such a limitation is lacking.

¹⁴ See *Knapp et al.*, Col. 2, Lines 43-47.

¹⁵ See the Specification, Page 2, Line 21 to Page 3, Line 4.

¹⁶ See the Specification, Page 5, Lines 19-22 for but a few examples of an organic solvent.

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The present claims 1-20 are believed to be in allowable form. It is respectfully requested that the application be forwarded for allowance and issue.

Respectfully Submitted,

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Version With Markings to Show Changes Made

In the Specification.

Please replace the paragraph beginning at Page 9, Line 7 with the following:

After an IPA rinse 310, a chamber part can be blown dry with nitrogen gas N₂. N₂ gas may be an inert gas that is essentially non-reactive to quartz chamber parts and/or the atmosphere. An N₂ blow dry step 312 can accelerate the evaporation of IPA.